Space Weather Forecast

Issued on Sunday, 05 November 2023 at 13:37 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/G2 Minor/Moderate geomagnetic storms expected and chance of G3/Strong storming on 05-06 Nov due to coronal mass ejection arrival. Chance of Moderate Class flares.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Moderate, due to one Moderate class flare emitted from a developing and increasingly magnetically complex region in the southeast quadrant. There is a further large but less complex region also in the southwest quadrant. Two further complex regions are rotating close to the western limb, but still present a risk of further flare activity. Of the eight regions in the total, the remaining regions are generally benign and present negligible flare risks. Two new CMEs have been observed leaving the Sun in the last 24 hours, one to the east and one to the southwest. Initial analysis of satellite imagery suggests that these will miss the Earth, but a more detailed analysis will be conducted once sufficient imagery is available.

Solar Wind / Geomagnetic Activity: Three CMEs have been observed arriving at Earth in the last 24 hours, each with increasing levels of impact. The first was a glancing blow, likely to be from an eruption on 31 Oct and had limited effects on the solar wind speed, but increased the total magnetic field strength and birth south component to moderately negative levels. The second, early on 05 Nov from an eruption early on 02 Nov, increased speeds to slightly elevated levels and the magnetic field strength to very strong levels, also with a very strong negative north-south component. The third, which arrived close to midday UTC on 05 Nov, increased speeds to elevated levels and maintained the magnetic field strength at very strong levels. After an initially very strong positive north-south magnetic field response, the field rotated to a negative direction. Geomagnetic activity rose from Quiet to Unsettled at the start of the period, to reach G1/Minor Storm between 04/1500-2100 UTC. A decline through Active in the following period was followed by a Quiet to Unsettled period until 05/0600-0900 UTC. A further G1/Minor Storm interval was observed at 05/0900-1200 UTC.

UK Aurora Analysis: Aurora was observed across northern Scotland, and clearly visible from Shetland.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained close to background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary
Solar Activity: Low to Moderate solar activity is expected, with chance of isolated M-class flares mainly from a developing region in the southeast quadrant.

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Solar Wind / Geomagnetic Activity: Three CMEs have arrived in the last 24 hours, with no further arrivals forecast. Speeds are around 500 km/s and may increase to around 600 km/s due to the evolving effects of the current CME. Speeds may then gradually decline before the forecast onset of a fast solar wind, most likely on 07 Nov. Geomagnetic activity is forecast to be around G1/Minor Storm or G2/Moderate Storm on 05 Nov and perhaps into 06 Nov due to the recent CME arrivals, with a chance of G3/Strong Storms. Activity is then forecast to gradually wane through 06 Nov prior to the connection to the fast solar wind, probably on 07 Nov when further G1/Minor Storm intervals are possible.

UK Aurora Forecast: Aurora may be observed across much of Scotland, along with Northern Ireland, northern England and perhaps down across the Midlands and much of Wales for the night of 05 Nov into 06 Nov.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to persist at around background with no solar radiation storms occurring.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	80	70	20	10
Strong	G3	No	30	30	1	1
Severe	G4	No	5	5	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	40	40	40
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	2	2	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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